FINAL REPORT

LEXINGTON-BLUE GRASS DEPOT ACTIVITY

EEAP PROJECT NO. 208

VOLUME I. EXECUTIVE SUMMARY

PREPARED FOR:

U. S. DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
LOUISVILLE, KENTUCKY

BY:

GRESHAM, SMITH AND PARTNERS
3310 WEST END AVENUE
NASHVILLE, TENNESSEE 37203
(615) 385-3310

JANUARY, 1984

DEPARTMENT OF THE ARMY
CONSTRUCTION ENGINEERING RESEARCH LABORATORIES, CORPS OF ENGINEERS
P.O. BOX 9005
CHAMPAIGN, ILLINOIS 61826-9005

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ABSTRACT

The report herein is part of a major energy plan to reduce energy consumption among Army facilities. There are four such plans which comprise the Army Energy Program.

1. Army Energy Plan (AEP)
2. Army Facilities Energy Plan (AFEP)
3. MACOM Facilities Energy Plans
4. Installation Facility Energy Plans (IFEP)

This report is a product of the Army Facilities Energy Plan. The plan's goals are:

- o To reduce baseline FY 1975 total facilities energy consumption (BTU) 20 percent by FY 1985 and 40 percent by FY 2000.
- o To develop the capability to use synthetic gases by FY 2000.
- o To reduce heating oil consumption by 75 percent by FY 2000.

Five programs have been established to help achieve the above goals. The programs are:

1. The Energy Engineering Analysis Program (EEAP)
2. The Energy Conservation Investment Program (ECIP)
3. The Energy Conservation and Management Program (ECAM)
4. Solid Fuels Conversion Program
5. The Boiler Efficiency Improvement Program (BEIP)

This report is the fourth and final report resulting from the Energy Engineering Analysis Program (EEAP) for the Lexington-Blue Grass Depot Acitivty. The first report (Phase I) consisted of a presentation of data gathered from the plant. The second report (Phase II) made recommendations to improve plant energy consumption. The third and fourth reports (Phase III and IV) consists of the information developed in Phase II with complete programming documents (Project Development Brochures (PDB) and DD 1391 forms) for the recommended projects.

The work was divided into increments which were to be studied. The increments funded for the Depot were: Increment "A" - Building Modifications, Increment "B" - Energy Distribution Systems and Energy Monitoring and Control Systems (EMCS), Increment "C" - Solar and Boimass Applications, Increment "E" -Installing Central Boiler Plants or Solid Fuel Conversion of Existing Plants, Increment "F" - Modifications to Systems and Operations and Summarized Projects Identified in Increments "A", "B", "C", "E" and "G", and Increment "G" - projects identified in

Increments "A" and "B" which do not meet the Energy Conservation Investment Program (ECIP) guidelines for funding.

This report is organized into five sections: Executive Summary (Vol. I), Narrative Report (Vol. II), Appendix (Vol. III), Programming Documents (Vol. IV) and Phase I Data Gathering (Vol. V).

This Executive Summary is unique to the other volumes and reports of other Increments. It is a summary of all work included in the EEAP study. The study began with Increments "A", "B", "E" and "G". Increment "F" was added later. Also, the contract with the AE was modified to include Increment "C". ECIP criteria was also changed during the course of the study. As a result, PDB and 1391 forms were rewritten to reflect the changes in the criteria. Consequently, values and figures in this volume may not match those found in other volumes. However, this volume contains the most complete up-to-date information pertaining to the entire EEAP study. The reader is referred to the cover of the report concerning report date, scope of work and ECIP criteria used.

LEXINGTON-BLUE GRASS DEPOT ACTIVITY
EEAP PROJECT NO. 208

EXECUTIVE SUMMARY

I. INTRODUCTION

The Lexington-Blue Grass Depot Activity is located near the cities of Lexington and Richmond in Kentucky.

Originally, Lexington-Blue Grass was two separate depot activities. Both were begun in 1941 with permanent and temporary structures being built. The Lexington activity, located adjacent to Avon, Kentucky, was used as a signal depot until 1962 at which time it became the Lexington Army Depot. The Blue Grass Facility in Richmond, Kentucky was established as the Blue Grass Ordinance Depot. In 1962, the Richmond Facility became The Blue Grass Army Depot. The two facilities were merged into one depot complex with two activities in 1964.

Figure 1-1 and Figure 1-2 show the site plans of the Lexington and Blue Grass Activities respectively. Figure 1-3 shows the vicinity and location of the depots. The Blue Grass Facility Site Plan shows only the Unrestricted Area. The Restricted Area is too large to effectively show on the site plan. The following table gives a breakdown of the number of buildings and their types for the two Activities.

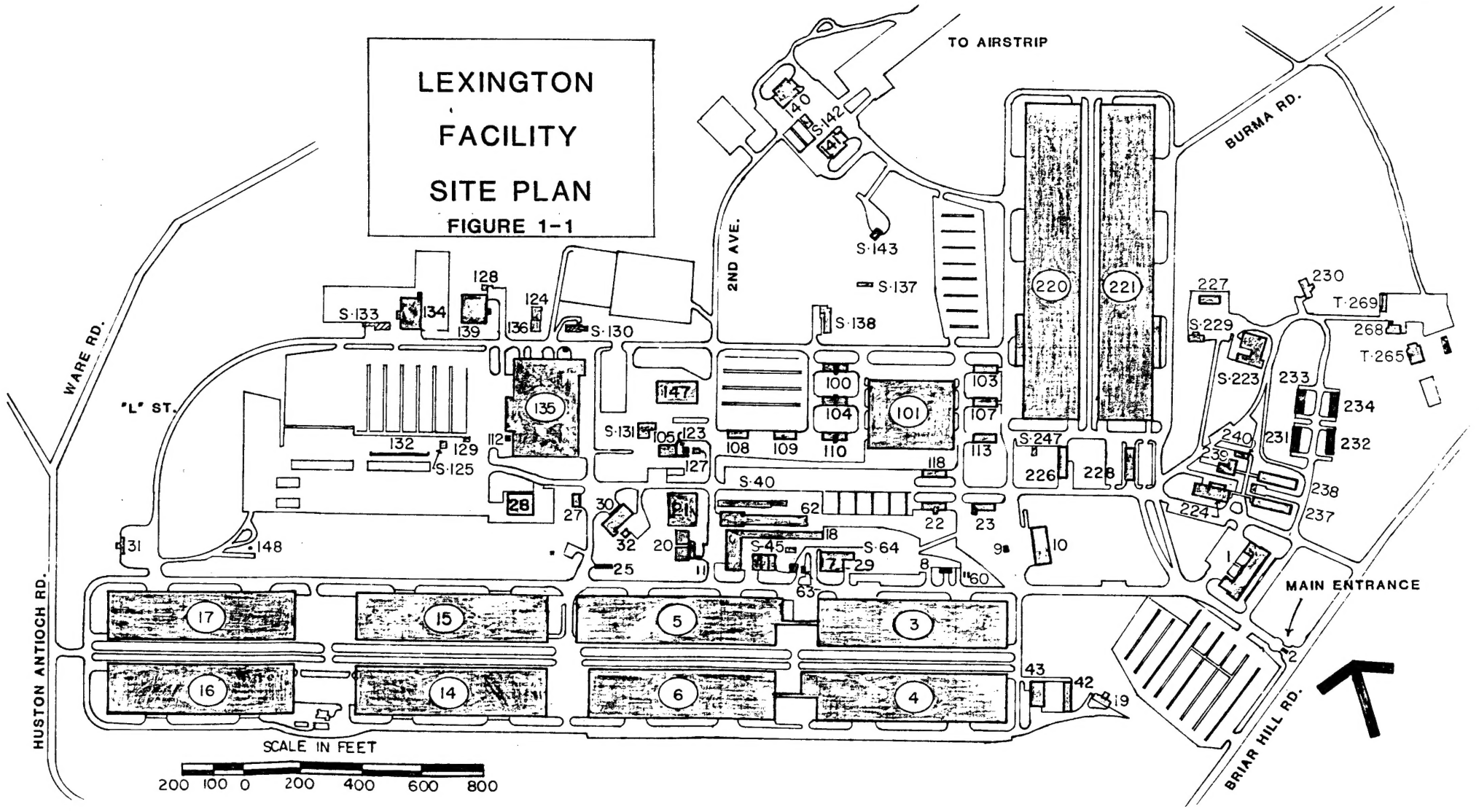
SCHEDULE OF BUILDINGS FOR LEXINGTON AND BLUE GRASS

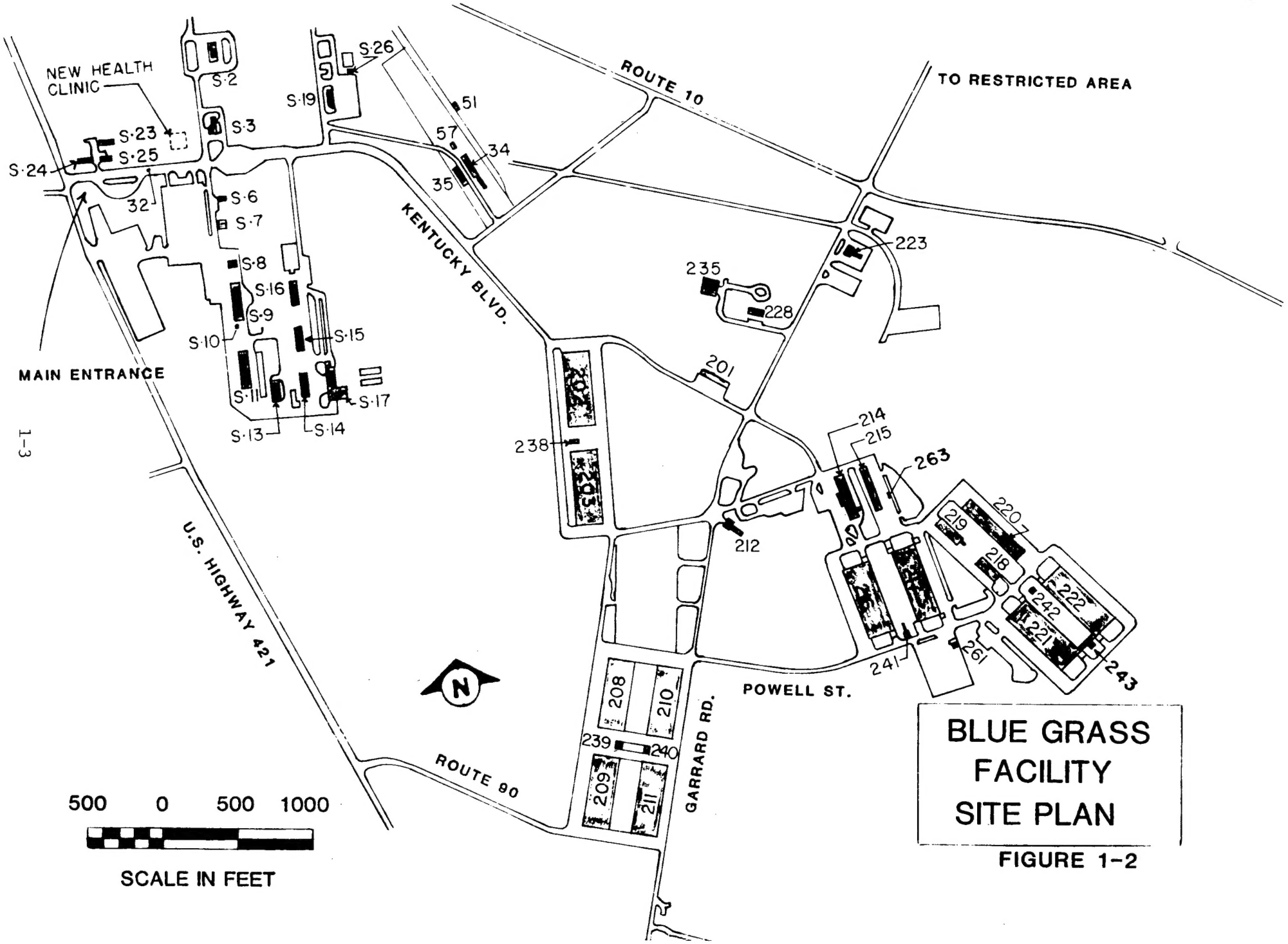
Buildings	Lexington	Blue Grass	Total
Permanent	88	196	284
Semi-permanent	20	31	51
Temporary	2	9	11
Igloo	0	902	902
Magazines	0	12	12
Family Housing	15	2	17
TOTALS	125	1,152	1,277

The authorized mission of the Lexington-Blue Grass Depot Activity is essentially to operate a supply depot providing for the receipt, storage, issue, and disposal of assigned commodities; provide installation support to attached organizations, and operate such other facilities as may be assigned. Neither facility is currently at its full capacity.

LEXINGTON FACILITY SITE PLAN

FIGURE 1-1





BLUE GRASS FACILITY SITE PLAN

FIGURE 1-2

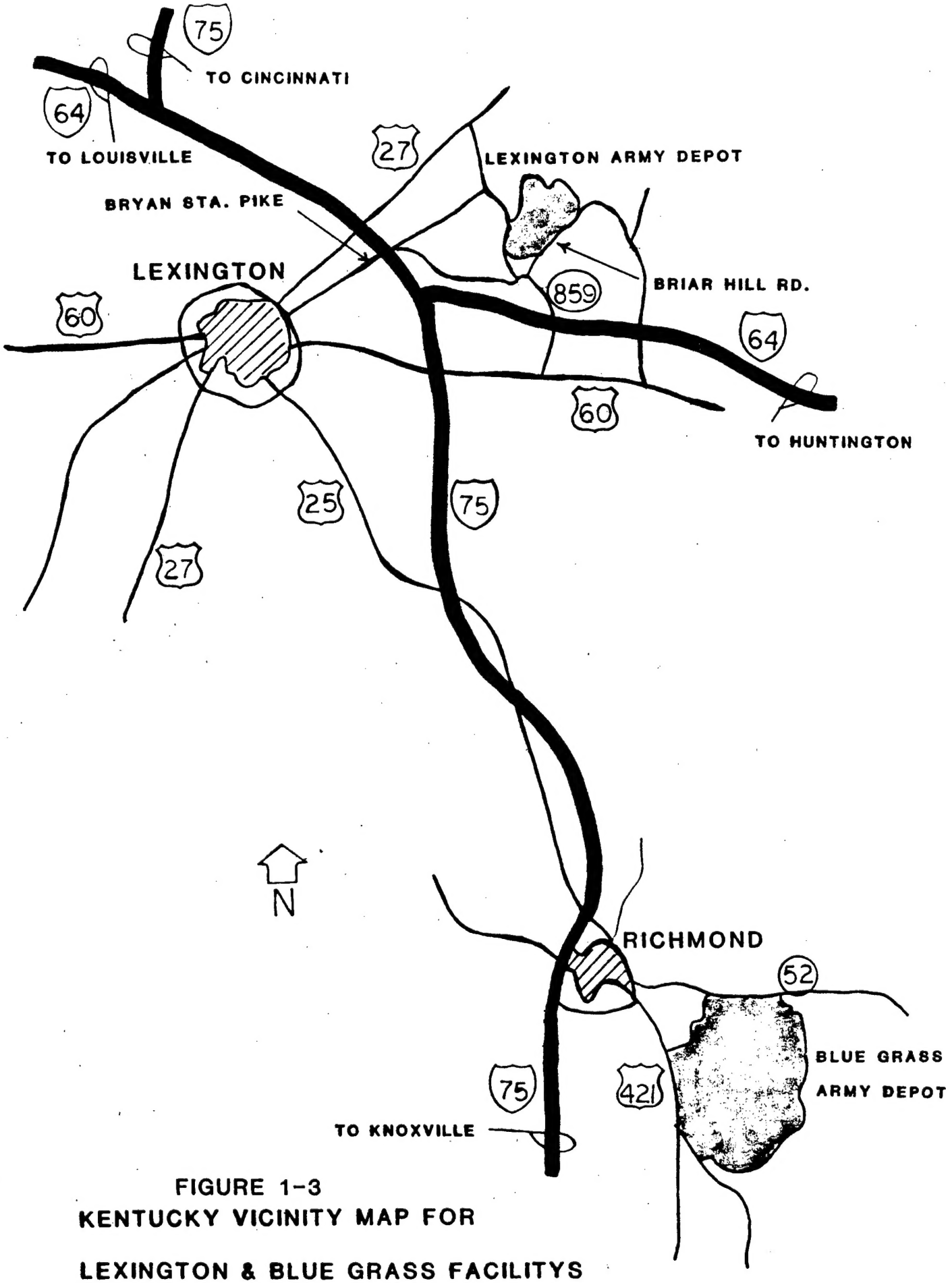


FIGURE 1-3
KENTUCKY VICINITY MAP FOR
LEXINGTON & BLUE GRASS FACILITYS

NO SCALE

The major processes for the Lexington Facility are two computer centers for UPS and COMSEC. A large plating shop was once part of the facility's mission but is not now in use. Other processes of the Lexington Facilities include a Nucleonics Laboratory and a Calibration Laboratory.

The Blue Grass Facility is set up to store and distribute ammunition and supplies and serves as an assembly and packing plant for small arms ammunition. There is a large washout plant for removing TNT from canisters and a painting operation. Also, at the Blue Grass Facility as a tenant, is a Strategic Air Command Training Center for the Air Force.

II. EXISTING ENERGY CONSUMPTION

The Depot Activity, involving both facilities, consumed a total of 549,200 MBTU of energy in FY 1975. In FY 1980, the total energy used was 399,400 MBTU. The drop in energy consumption from 1975 to 1980 is due to a scale down in operations and a major insulation project performed in 1976-1977. Table 1-1 gives the energy source breakdown for FY 1980 and FY 1975.

Table 1-2 shows typical energy consumption and how the energy consumed by the Depot is distributed between heating, cooling, lighting, and process energy. Figure 1-4 gives the same information graphically.

III. ENERGY CONSERVATION MEASURES

As a result of the data gathered during Phase I of the project, a number of energy conservation measures were studied.

Projects were considered under a total of six categories or Increments as described in the Scope of Work for the Energy Engineering Analysis Program (EEAP). The Scope of Work is included in the Appendix as Exhibit 1. (Page 3-1) Increment A projects involve modifying, improving or retrofitting existing buildings and systems to improve energy consumption. Increment B projects involve utilities and energy distribution systems, Energy Management Control Systems (EMCS) and central boiler plants. Increment "C" includes Solar and Biomass applications. Increments "A", "B" and "C" projects were evaluated using Energy Conservation Investment Program (ECIP) criteria. Projects which were energy saving but which did not qualify as ECIP projects were recommended as Increment G projects.

Table 1-3 gives a list of projects investigated. Table 1-4 lists the actual projects which qualified under the ECIP criteria and which are being proposed as such.

The additional energy saving projects which are being recommended under Increment "G" and are listed in Table 1-5 with a brief description of the project. Projects indetified in Increment "F" are listed in Table 1-6.

Projects that were investigated but not recommended are listed in Table 1-7. Each of the projects were considered but were rejected because of economic factors (e.g. savings and costs). Calculations can be found in Vol. III of this report for the more promising projects in the list.

TABLE 1-1
ENERGY CONSUMPTION
FY 1975 & 80

FACILITY	SOURCE	FY 1975		FY 1980		"80" COST $
		MBTU	UNITS CONSUMED	MBTU	UNITS CONSUMED	
LEXINGTON	Electricity	242,000	20,862,000 KWH	153,600	13,241,000 KWH	397,230
	Coal	192,000	7,810 Tons	144,000	5,860 Tons	269,560
	Fuel Oil	-	-	7,000	50,469 Gals	61,572
	Propane	3,400	35,602 Gals	2,600	27,225 Gals	22,052
	Natural Gas	1,800	1,745 Therms	1,400	1,357 Therm	434
BLUE GRASS	Electricity	47,000	4,052,000 KWH	38,600	3,327,000 KWH	99,810
	Coal	-	-	-	-	-
	Fuel Oil	63,000	454,217 Gals	52,200	376,351 Gals	459,148
	Propane	-	-	-	-	-
	Natural Gas	-	-	-	-	-
TOTAL FOR ACTIVITY	Electricity	289,000	24,914,000 KWH	192,200	16,569,000 KWH	497,040
	Coal	192,000	7,810 Tons	144,000	5,860 Tons	269,560
	Fuel Oil	63,000	454,217 Gals	59,200	426,820 Gals	520,720
	Propane	3,400	35,602 Gals	2,600	27,225 Gals	22,052
	Natural Gas	1,800	1,745 Therms	1,400	1,357 Therm	434
TOTAL		549,200	----	399,400	----	1,309,806

TABLE 1-2
ANNUAL BUILDING ENERGY CONSUMPTION
(LEXINGTON)

Bldg. No.	Floor Area (SF)	Energy Sources Consumption (MBTU/Yr)					Energy Use Consumption (MBTU/YR)					BTU SF-Yr.
		Elec	Oil	Gas	Coal	Tot	Heat	Cool	Lights	Proc	Tot	
1	44000	9700	-	-	10800	20500	10700	2300	5200	2300	20500	460,000
2	160	150	-	-	670	820	670	140	10	-	820	5,125,000
3	132000	1200	-	-	6600	7800	6700	400	700	-	7800	59,000
4	137000	33000	-	-	4500	37500	5600	6200	19100	7200	37500	270,000
5	142000	93000	-	-	8700	18000	8700	800	8500	-	18000	130,000
6	1200	150	-	-	530	680	530	40	110	-	680	570,000
7	9500	550	-	-	-	550	-	-	550	-	550	58,000
8	-	-	-	-	-	-	-	-	-	-	-	-
9	375	17	-	-	460	480	460	5	10	5	480	1,300,000
10	8600	730	-	-	5000	5700	5000	10	590	100	5700	660,000
11	2400	260	-	-	940	1200	940	50	110	100	1200	500,000
14	21900	1300	-	-	4700	6000	4800	-	1000	200	6000	270,000
15	3500	700	-	-	2100	2800	2100	150	250	300	2800	800,000
16	132000	400	-	-	-	400	-	70	50	280	400	3,000
17	1300	560	-	-	400	960	400	30	230	300	960	740,000
18	18700	10000	-	-	6400	16400	6500	80	9800	20	16400	880,000
19	2400	-	-	-	-	-	-	-	-	-	-	-
21	-	-	-	-	-	-	-	-	-	-	-	-
22	3300	-	-	-	-	-	-	-	-	-	-	-
23	3500	-	-	-	-	-	-	-	-	-	-	-
25	1600	170	-	-	670	840	670	150	20	-	840	530,000
26	500	-	-	-	-	-	-	-	-	-	-	-
27	1000	-	-	-	20	20	20	-	-	-	20	20,000
28	2000	-	-	-	-	-	-	-	-	-	-	-
30	7100	1000	-	-	2800	3800	2800	150	850	-	3800	535,000
31	500	-	-	-	-	-	-	-	-	-	-	-
32	900	15	-	-	185	200	185	-	15	-	200	200,000
36	400	80	-	-	40	120	40	40	40	-	120	300,000
37	400	80	-	-	40	120	40	40	40	-	120	300,000
40	7300	-	-	-	-	-	-	-	-	-	-	-
41	11000	5	-	-	-	5	-	-	5	-	5	450
45	800	-	-	-	-	-	-	-	-	-	-	-

TABLE 1-2
ANNUAL BUILDING ENERGY CONSUMPTION
(LEXINGTON)

Bldg. No.	Floor Area (SF)	Energy Sources Consumption (MBTU/Yr)					Energy Use Consumption (MBTU/YR)					BTU/SF-Yr.
		Elec	Oil	Gas	Coal	Tot	Heat	Cool	Lights	Proc	Tot	
62	-	-	-	-	-	-	-	-	-	-	-	-
63	400	-	-	-	-	-	-	-	-	-	-	-
64	1300	-	-	-	-	-	-	-	-	-	-	-
100	3000	200	-	-	730	930	740	-	180	10	930	310,000
101	1280	130	-	-	300	430	300	30	100	-	430	340,000
103-113	3000	-	-	-	-	-	-	-	-	-	-	-
117	300	40	-	-	190	230	190	15	25	0	230	770,000
118	2700	-	-	-	-	-	-	-	-	-	-	-
123	206	-	-	-	-	-	-	-	-	-	-	-
127	600	-	-	-	-	-	-	-	-	-	-	-
130	2800	-	-	-	-	-	-	-	-	-	-	-
131	3500	110	-	-	1500	1600	1500	-	100	10	1600	460,000
133	1800	-	-	-	-	-	-	-	-	-	-	-
134	9600	1600	-	-	1400	3000	1400	250	1300	50	3000	310,000
135	117000	2700	-	-	5300	8000	5300	900	1600	200	8000	68,000
137	1300	-	-	-	-	-	-	-	-	-	-	-
138	2900	470	-	-	1500	2000	1550	200	250	-	2000	690,000
139	11000	1400	-	-	1600	3000	1800	350	750	100	3000	270,000
140	7000	350	-	-	200	550	220	20	300	10	550	79,000
141	7000	-	-	-	-	-	-	-	-	-	-	-
142	1800	-	-	-	-	-	-	-	-	-	-	-
143	1200	-	-	-	-	-	-	-	-	-	-	-
147	12800	2100	-	-	2700	4800	2800	140	1200	660	4800	375,000
220	248000	21000	-	-	38000	59000	38400	1550	18400	650	59000	240,000
221	248000	53000	-	-	4300	57000	4300	3300	28000	21400	57000	230,000
223	10000	1700	-	-	3800	5500	3800	380	650	670	5500	550,000
224	4000	500	-	-	1500	2000	1500	140	300	60	2000	500,000
226	4300	500	-	-	1800	2300	1900	200	200	-	2300	530,000
227	1000	200	-	-	400	600	400	50	100	50	600	600,000
229	1500	200	-	-	550	750	550	50	100	50	750	500,000
230	2500	300	-	-	1500	1800	1500	200	50	50	1800	720,000

TABLE 1-2
ANNUAL BUILDING ENERGY CONSUMPTION
(LEXINGTON)

Bldg. No.	Floor Area (SF)	Energy Sources Consumption (MBTU/Yr)					Energy Use Consumption (MBTU/YR)					BTU / SF-Yr.
		Elec	Oil	Gas	Coal	Tot	Heat	Cool	Lights	Proc	Tot	
231-234	5600	180	-	220	-	400	220	80	70	30	400	71,000
237	3900	350	-	210	-	560	210	130	180	40	560	160,000
238	4200	380	-	220	-	600	220	150	200	30	600	140,000
239-240	4100	3600	-	-	2000	5600	2000	200	800	2600	5600	140,000
268	1700	300	-	-	-	300	15	130	100	55	300	180,000

TABLE 1-2
ANNUAL BUILDING ENERGY CONSUMPTION
(BLUE GRASS)

Bldg. No.	Floor Area (SF)	Energy Sources Consumption (MBTU/Yr)					Energy Use Consumption (MBTU/YR)					BTU/SF-Yr.
		Elec	Oil	Gas	Coal	Tot	Heat	Cool	Lights	Proc	Tot	
2	11000	1000	1100	-	-	2100	1100	320	680	-	2100	190,000
3	10000	1400	800	-	-	2200	800	250	1150	-	2200	220,000
6	1500	80	600	-	-	680	600	20	60	-	680	450,000
7	1510	140	650	-	-	790	650	50	90	-	790	520,000
8	4350	600	700	-	-	1300	700	150	200	250	1300	300,000
9	16720	550	1600	-	-	2150	1600	5	420	125	2150	130,000
10	350	40	180	-	-	220	180	30	10	-	220	630,000
11	16500	480	1600	-	-	2080	1600	37	413	30	2080	130,000
12	1600	-	100	-	-	100	100	-	-	-	100	63,000
13	12000	420	940	-	-	1360	970	20	320	50	1360	110,000
14	12000	260	1500	-	-	1760	1500	50	200	10	1760	150,000
15	12000	60	-	-	-	60	-	-	60	-	60	5,000
16	12000	60	-	-	-	60	-	-	60	-	60	5,000
17	16500	830	3100	-	-	3930	3100	5	650	175	3930	238,000
18	-	-	-	-	-	-	-	-	-	-	-	-
19	5000	460	610	-	-	1070	660	45	350	15	1070	210,000
20	3000	210	770	-	-	980	780	110	100	-	980	330,000
23	5400	50	280	-	-	330	280	-	50	-	330	61,000
24	2000	210	480	-	-	690	490	70	130	-	690	350,000
25	1000	60	200	-	-	260	200	15	45	-	260	260,000
26	900	20	-	-	-	20	-	5	15	-	20	22,000
29	4000	270	940	-	-	1210	940	120	150	-	1210	300,000
32	150	30	210	-	-	240	210	20	10	-	240	1,600,000
34	9100	-	-	-	-	-	-	-	-	-	-	-
35	500	-	-	-	-	-	-	-	-	-	-	-
40	40	-	-	-	-	-	-	-	-	-	-	-
41	50	-	-	-	-	-	-	-	-	-	-	-
51	-	-	-	-	-	-	-	-	-	-	-	-
53	40	-	-	-	-	-	-	-	-	-	-	-
54	120	-	-	-	-	-	-	-	-	-	-	-
55	50	-	-	-	-	-	-	-	-	-	-	-
57	5200	-	-	-	-	-	-	-	-	-	-	-

TABLE 1-2
ANNUAL BUILDING ENERGY CONSUMPTION
(BLUE GRASS)

Bldg. No.	Floor Area (SF)	Energy Sources Consumption (MBTU/Yr)					Energy Use Consumption (MBTU/YR)					BTU / SF-Yr.
		Elec	Oil	Gas	Coal	Tot	Heat	Cool	Lights	Proc	Tot	
58	800	-	-	-	-	-	-	-	-	-	-	-
200	250	-	-	-	-	-	-	-	-	-	-	-
201	11600	40	150	-	-	190	150	15	25	-	190	16,000
202-203	-	-	-	-	-	-	-	-	-	-	-	-
208-211	9000ea.	-	-	-	-	-	-	-	-	-	-	-
216-217	-	-	-	-	-	-	-	-	-	-	-	-
206-207	850ea.	-	-	-	-	-	-	-	-	-	-	-
212	3500	390	900	-	-	1240	910	80	300	-	1290	370,000
214	18500	690	3900	-	-	4590	3900	-	690	-	4590	250,000
215	18500	700	320	-	-	1020	320	10	690	-	1020	55,000
218	12000	410	2700	-	-	3110	2800	5	310	-	3110	260,000
219	17000	2200	3000	-	-	5200	3000	550	1650	-	5200	310,000
220	30500	-	-	-	-	-	-	-	-	-	-	-
223	2200	150	970	-	-	1120	970	5	125	20	1120	510,000
225	1200	-	-	-	-	-	-	-	-	-	-	-
226	2800	-	-	-	-	-	-	-	-	-	-	-
228	2600	490	390	-	-	880	390	10	100	380	880	340,000
230	530	440	1400	-	-	1840	1400	40	20	380	1840	3,500,000
238-239	1350ea.	1550	1150	-	-	2700	1150	-	1540	10	2700	1,000,000
240	1350	-	-	-	-	-	-	-	-	-	-	-
241	1730	-	100	-	-	100	100	-	-	-	100	57,000
242	1350	90	420	-	-	510	420	-	80	10	510	380,000
243	2900	-	-	-	-	-	-	-	-	-	-	-
244	100	-	-	-	-	-	-	-	-	-	-	-
245	110	-	-	-	-	-	-	-	-	-	-	-
248	110	3	200	-	-	203	200	-	3	-	203	1,800,000
261	1820	-	190	-	-	190	190	-	-	-	190	100,000
262	320	-	-	-	-	-	-	-	-	-	-	-
270	975	45	390	-	-	435	390	5	40	-	435	450,000

TABLE 1-2
ANNUAL BUILDING ENERGY CONSUMPTION
(BLUE GRASS)

Bldg. No.	Floor Area (SF)	Energy Sources Consumption (MBTU/Yr)					Energy Use Consumption (MBTU/YR)					BTU SF-Yr.
		Elec	Oil	Gas	Coal	Tot	Heat	Cool	Lights	Proc	Tot	
271	1930	-	520	-	-	520	520	-	-	-	520	270,000
273	3000	-	-	-	-	-	-	-	-	-	-	-
501, 624, 704, 848, 1003	850	-	-	-	-	-	-	-	-	-	-	-
550	18400	730	2670	-	-	3400	2670	-	700	30	3400	180,000
551, 556	700	-	-	-	-	-	-	-	-	-	-	-
554	400	-	-	-	-	-	-	-	-	-	-	-
555	22000	870	2900	-	-	3770	2900	-	830	40	3770	170,000
560	3400	140	1030	-	-	1170	1030	-	130	10	1170	340,000
562	19000	800	2800	-	-	3600	2900	-	675	25	3600	190,000
570	4000	13100	-	-	-	13100	-	-	60	13040	13100	3,300,000
571	900	-	-	-	-	-	-	-	-	-	-	-
902	4000	150	300	-	-	450	300	-	150	-	450	113,000
908	100	-	-	-	-	-	-	-	-	-	-	-
1137	850	-	-	-	-	-	-	-	-	-	-	-
1138	6300	250	1400	-	-	1650	1400	-	240	10	1650	260,000
1146	7500	290	1700	-	-	1990	1700	-	280	10	1990	270,000
1158	1000	-	-	-	-	-	-	-	-	-	-	-
1159	4800	-	-	-	-	-	-	-	-	-	-	-
1167	1000	-	-	-	-	-	-	-	-	-	-	-
1168	200	-	1260	-	-	1260	-	-	-	1260	1260	6,300,000
1170	11500	450	2900	-	-	3350	2900	-	440	10	3350	290,000
1180	8500	620	1800	-	-	2420	1810	-	270	340	2420	280,000
1181	1500	-	-	-	-	-	-	-	-	-	-	-
1303	500	-	-	-	-	-	-	-	-	-	-	-
1600	1500	40	350	-	-	390	360	-	30	-	390	260,000
SAC	7600	6550	-	-	-	6550	-	-	-	6550	6550	860,000

ACTUAL

ENERGY USE PROFILE (1980)

LEXINGTON BLUE GRASS DEPOT

FIGURE 1-4

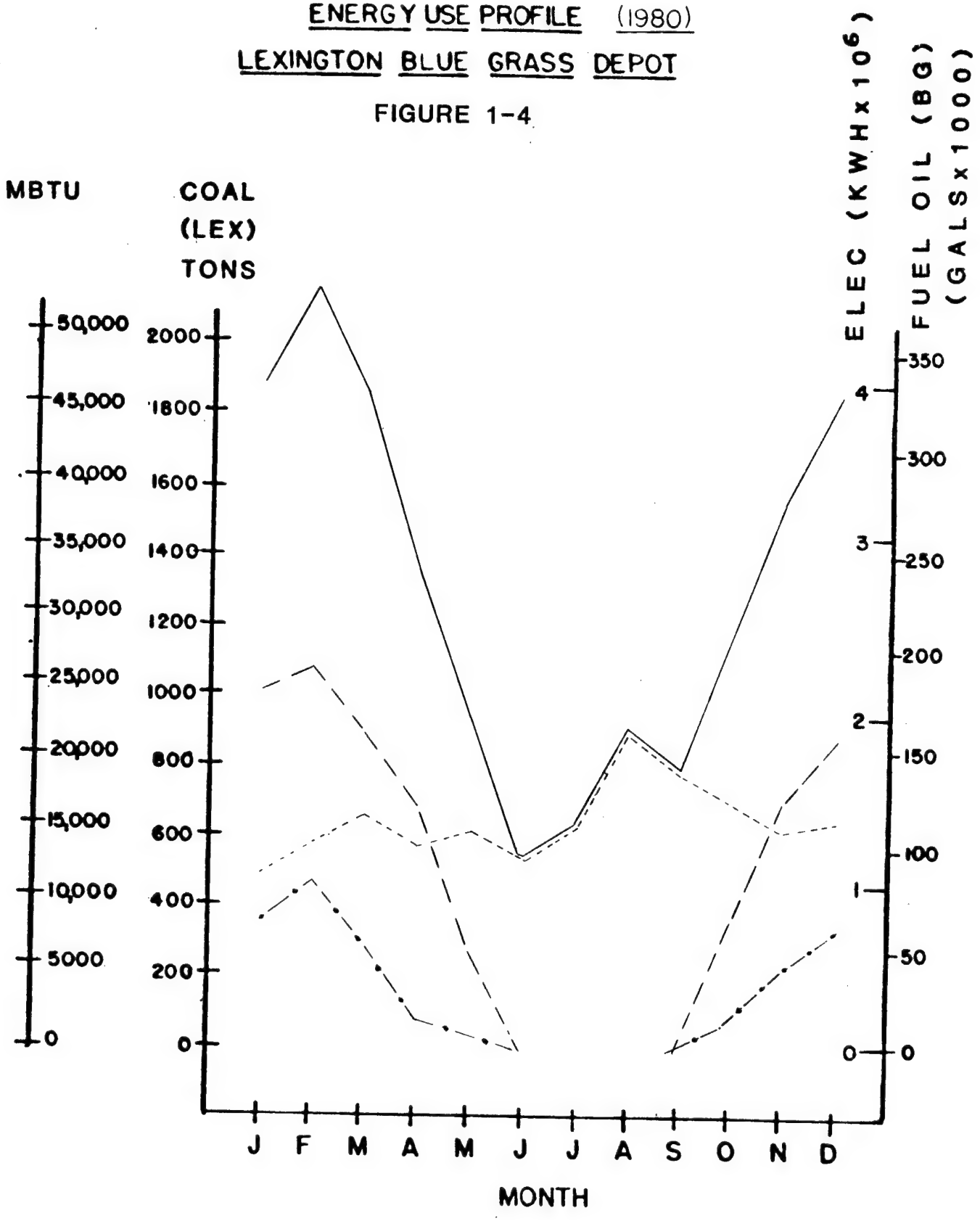


TABLE 1-3

ENERGY CONSERVATION MEASURES INVESTIGATED

Project Description

1. Insulate garage type doors throughout the Depot.
2. Apply storm windows to selected buildings.
3. Tint the glass of the front guardshack.
4. Modify the existing cooling system for Lexington 3 to improve efficiency.
5. Insulate the ceilings of the office in Bay F of Lexington 4.
6. Install access ladders to air handling units in Bay C of Lexington 4.
7. Install a free cool, glycol system for cooling the computer room of Lexington 4 in the winter.
8. Supply make-up air for the dry duplicator in Bay A of Lexington 4.
9. Install downblowers in heated warehouses with high ceilings.
10. Install thermostatically controlled valves on radiators in Lexington 1.
11. Repipe the chilled water system in the Mechanical Room of Lexington 1 to improve efficiency.
12. Install a separate heating/cooling system for Lexington 1's security office to facilitate using a night setback for the rest of the building.
13. Install vapor barriers for dehumidified buildings at Lexington Facility.
14. Install air curtains at roll-up dock doors to reduce infiltration during winter.
15. Provide return air ducts and grills for the heating/cooling system in Lexington 18 to improve efficiency.
16. Insulate walls and ceilings of offices in unheated warehouses. Insultate concrete block walls for office buildings. Insulate concrete slab roofs for heated buildings. Insulate floors over crawl space.
17. Provide make-up air for print machine in Lexington 18.
18. Replace wet sprinkler system in Lexington 3, 43, and 135 with a dry one to eliminate the need to heat the building in winter.
19. Replace the 75HP air compressor for process in Lexington #147 with 10HP compressor.

20. Install heat reclamation system for computer equipment in Lexington #221 and the Strategic Air Command at Blue Grass.

21. Provide roll-down covers for display cases in commissary.

22. Delamp buildings with high light levels.

23. Insulate steam lines and valves in mechanical rooms at Blue Grass.

24. Eliminate heat for Blue Grass #23 and modify system to prevent freeze-up of plumbing.

25. Provide automatic operable louvers in Blue Grass #7.

26. Turn down setpoints for hot water heater.

27. Install FM radio controls to shut off heaters during time of high electrical demand.

28. Shut down heat for Lexington 25 and heat tape plumbing.

29. Heat tape pipes in attics of family housing units at Lexington to eliminate need to heat attics.

30. Provide make-up air to paint spray booths in Blue Grass #1180 to reduce the amount of make-up air which must be heated.

31. Provide economizer controls for Modulabs in Lexington #134.

32. Provide Energy Management Control Systems for Lexington and for Blue Grass facilities to control time of day starting, duty cycling, demand limit, night setbacks, and lighting levels.

33. Provide controls for steam plant at Lexington to improve efficiency of plant and to facilitate tuning the boilers. Replace motors for induced draft fans for the flue gas with eddie current drive motors.

34. Provide a coal-fired boiler plant to heat the buildings in the unrestricted area at Blue Grass.

35. Heat reclamation from Deactivation Furnaces at Blue Grass.

36. Install steam lines to small offices in Lexington 15, 17, and 101.

37. Install instantaneous hot water heaters to replace storage type heaters in remote restrooms where water usage is low.

38. Provide shelter to cover stored coal to improve its heat content by reducing its moisture level.

39. Install a solar energy preheater for the washout process in Blue Grass #570.

40. Provide solar water heating systems for domestic hot water in family housing units and other selected buildings.

41. Provide a heat reclamation system for the refrigeration equipment in Lexington #239 and #240.

42. Convert oil-fired hot air furnaces to electric heat pumps.

43. Skylighting techniques.

44. Efficient outdoor lighting methods.

45. Domestic hot water heater timers.

TABLE 1-4

ECIP PROJECTS DEVELOPED

A-1 INSULATION PROJECT

a. Roll-up Doors
b. Storm Windows
c. Warehouse Offices
d. Steam Line and Valve Insulation
e. Miscellaneous

A-2 DOWN BLOWERS

A-3 HEATING AND COOLING MODIFICATIONS

a. Piping Redesign for Lexington #1, Mechanical Room
b. Heating and Cooling System for Security in Lexington #1
c. Thermostatic Radiator Valves
d. Blue Grass #23
e. Paint Spray Make-up for Blue Grass #1180
f. Sprinkler System Conversion
g. Economizer for Cycles for Lexington #134
h. Lexington #139 Modifications
i. "Free Cool" Cooling System for Computer Rooms
j. Time Clocks and Night Setbacks

B-1 BOILER PLANT IMPROVEMENTS

C-1 BIOMASS BOILER FUEL MODIFICATIONS

TABLE 1-5

ADDITIONAL ENERGY SAVING PROJECTS RECOMMENDED IN INCREMENT "G"

G-1 Reduce domestic hot water temperatures to 100°F.

G-2 Lexington Building #4, Outside Air Dampers:

Seal the outside air vents in 9 fan coil units above ceiling in Bay C.

G-3 Lexington Building #135, Compressor Replacement:

Replace the 75 HP air compressor with a 10 HP compressor to serve sandblasting process in Lexington #147.

G-4 Blue Grass Building #7:

Install operable louvers on attic vents.

G-5 Delamp in the following areas, reducing the existing lighting level to 50 fc.

LEXINGTON FACILITY

Building No.	Existing FC	Building No.	Existing FC
1 Office Area - 2nd Floor	60	17 Offices	100
Office Area - 3rd Floor	60	134 Front Office	75
Computer Room - Basement	75	Work Area	70
4 Bay A Work Area	70	220 Library	80
Bay A South Office	75	239-240 Main Area	130
Bay C Work Area	80		

BLUE-GRASS FACILITY

Building No.	Existing FC	Building No.	Existing FC
2 Deputy's Office	100	219 1st Fl. Office E.	125
3 1st Floor Offices	100	1st Fl. Office W.	100
14 FACENG Office	75	Chemical Surety	75
24 Front Office	80	Office	

TABLE 1-6

ENERGY SAVING PROJECTS

RECOMMENDED IN INCREMENT "F"

F-1a	Insulate doors and windows.
F-1b	Insulate ducts and steam lines
F-1c	Weatherstrip & Misc.
F-2a	Delamping
F-2b	Skylighting techniques in warehouses
F-2c	Outside lighting retrofits
F-2d	Warehouse lighting timers
F-3	Domestic hotwater timers

TABLE 1-7

ENERGY CONSERVATION MEASURES INVESTIGATED BUT NOT RECOMMENDED

1. Provide return air ducts and grills for the heating/cooling systems in Lexington #18 to improve efficiency.

2. Install heated reclamation system for computer equipment in Lexington #221 and the Strategic Air Command at Blue Grass.

3. Insulate floors over crawl spaces.

4. Provide roll-down covers for display cases in commissary.

5. Install FM radio controls to shut off heaters during times of high electrical demand.

6. Heat tape pipes in attics of family housing units at Lexington to eliminate need to heat attics.

7. Provide Energy Management Control Systems for Lexington and Blue Grass facilities to control time of day starting, duty cycling, demand limit, night setback, and lighting levels.

8. Provide a coal-fired boiler plant to heat the buildings in the unrestricted area at Blue Grass.

9. Heat reclamation from Deactivation Furnaces at Blue Grass.

10. Provide make-up air for print machine in Lexington #18.

11. Install steam lines to small offices in Lexington 15, 17, and 101.

12. Install air curtains at roll-up dock doors to reduce infiltration during winter.

13. Install instantaneous hot water heaters to replace storage type heaters in remote restrooms where water usage is low.

14. Provide shelter to cover stored coal to improve its heat content by reducing its moisture level.

15. Install vapor barriers for dehumidified buildings at Lexington Facility.

16. Supply make-up air for the dry duplicator in Bay A of Lexington 4.

17. Install a solar energy preheater for the washout process in Blue Grass #570.

18. Tint the glass of the front guardshack.

19. Provide solar water heating systems for domestic hot water in family housing units.

20. Provide a heat reclamation system for the refrigeration equipment in Lexington #239 and #240.

21. Convert oil-fired hot air furnaces to electric heat pumps.

22. Heat pump installation.

23. Modify the existing cooling system for Lexington 3 to improve efficiency.

IV. ENERGY AND COST SAVINGS

The total consumption for the Depot after the all recommended projects are implemented is estimated to be 240,220 MBTU/Yr. which is a savings of 139,000 MBTU/Yr. This results in a 56% reduction over the 1975 energy consumption of 549,200 MBTU/YR. Table 1-8 shows the allocation of energy savings by Increment and the projected FY 1985 consumption. Tables 1-7 through 1-12 show the allocation of energy conservation project savings along with other pertinent information.

TABLE 1-8

LEXINGTON - BLUE GRASS DEPOT FACILITY
ENERGY REDUCTIONS AND PROJECTIONS
(MBTU)

	1975 USAGE	PREVIOUS REDUCTION	1981 USAGE	INC. A REDUCTION	INC. B REDUCTION	INC. C REDUCTION	INC. F REDUCTION	INC. G REDUCTION	TOTAL REDUCTION
COAL	191970	75682	116288	24505	23960	60240	3105	1092	188584
ELEC	289000	75432	213568	3213	7900	3362	5122	1915	96944
OIL #2	63000	9624	53376	12577	0	0	196	180	22577
PROPANE	3382	-277	3659	100	0	0	0	0	-177
NAT. GAS	1800	1004	796	0	0	0	0	0	1004
BIOMASS	0	0	0	0	0	-60240	0	0	-60240
TOTALS	549152		387687	40395	31860	3362	8423	3187	248692

	PROJECTED 1985 USAGE	% REDUCED FROM 1981	% REDUCED FROM 1975
COAL	3386	97 %	98 %
ELEC	192056	10 %	34 %
OIL #2	40423	24 %	36 %
PROPANE	3559	3 %	-5 %
NAT. GAS	796	0 %	56 %
BIOMASS	60240	-100 %	-100 %
TOTALS	240220	38 %	56 %

TABLE 1-9

LEXINGTON & BLUEGRASS PROJECT SUMMARY

PROJECT	ANALYSIS DATE CONSTRUCTION COST $	SIOH COST $	DESIGN COST $	ENERGY SAVINGS MBTU / YR.	ANALYSIS DATE ANNUAL SAVINGS $	TOTAL NET DISCOUNTED SAVINGS $	SIR
A1-a Roll-Up DoorIns	31,000	1550	1860	6860	40,538	738,716	23.8
b-Storm Windows	61,100	3055	366	2182	10,991	202,855	3.3
c-Warehouse OfficeIns	11,950	598	717	1210	6,003	109,178	9.2
d-Storm Line&ValveIns	4,600	230	276	590	5,829	66,045	14.4
e-Miscellaneous Ins.	21,500	1075	1290	3963	24,178	439,537	20.5
A1 Total	130,150	6508	7809	14805	87,539	1,593,344	12.3
A2 Down-Blowers	79,800	3990	4788	5420	19,062	257,771	3.2
A3-a Mech. Room Modification	820	41	49	80	191	2,725	3.3
b-HVAC for Security	4160	208	250	1090	2696	36,647	8.8
c-Thermostatic Radiator Valves	8600	430	516	710	3200	40,877	4.7
d-Boiler Modification	1060	53	64	230	2272	25,746	24.3
e-Paint SprayMake-up	5900	295	354	100	988	11,194	1.9
f-Sprinkler Conver.	35,600	1780	2136	3920	8820	180,104	5.1
g-HVAC Modification	6,300	315	378	390	1080	12,491	1.9
h-HVAC Modification	1,550	78	93	80	1239	17,904	11.5
i-"Free Cool" Cooling System	23,900	1195	1434	1700	4743	54,450	2.3
j-Time Clock Setback	75,800	3790	4548	11870	57,819	722,817	9.5

TABLE 1-9 CONT.

LEXINGTON & BLUEGRASS PROJECT SUMMARY

PROJECT	ANALYSIS DATE CONSTRUCTION COST $	SIOH COST $	DESIGN COST $	ENERGY SAVINGS MBTU / YR.	ANALYSIS DATE ANNUAL SAVINGS $	TOTAL NET DISCOUNTED SAVINGS $	SIR
A3 Total	163,690	8185	9822	20,170	83,056	1,104,955	6.7
B1-Boiler Plant							
Improvement	228,000	11,400	13,680	31,860	77,591	1,455,630	6.4

TABLE 1-10

LEXINGTON & BLUEGRASS PROJECT SUMMARY

PROJECT	ANALYSIS DATE CONSTRUCTION COST $	SIOH COST $	DESIGN COST $	ENERGY SAVINGS MBTU / YR.	ANALYSIS DATE ANNUAL SAVINGS $	TOTAL NET DISCOUNTED SAVINGS $	SIR
G1-DHW Temp. Reduc.	120	6	7	35	98	1,496	12.5
G2-Seal Dampers	1,800	90	108	1,092	2,457	50,172	27.9
G3-Replace Compressor	2,900	145	174	370	1,032	11,851	4.1
G4-Install louvers	1,000	50	60	180	1,778	31,442	31.5
G5-Delamping	460	23	28	1,510	4,213	64,162	139.6

LEXINGTON-BLUEGRASS DEPOT
INCREMENT "F" PROJECT SUMMARY
TABLE 1-11

PROJECT	MAN HOURS	1982 COST LABOR	1982 COST MATERIAL	1st YEAR $ SAVINGS	ANNUAL ENERGY SAVINGS (MBTU)	TOTAL LIFE CYCLE BENEFITS	SIR
F1a Doors & Windows	80	990	1315	1340	595	20,670	8.9
F1b Duct & Steam Line	80	990	715	2180	285	24,823	14.5
F1c Weather-strip & Misc.	30	370	580	5650	2510	87,197	91.8
F2a Delamping	120	1480	0	2913	1044	33,438	22.6
F2b Skylighting	80	990	500	2871	1029	32,958	22.1
F2c Outside Lighting	340	4200	25,500	5859	2100	67,261	2.3
F2d Whse. light. Timers (per Bldg)	160	2000	8000	2650	950	30,428	3.1
F3 DHW Heater Timers	40	495	1600	920	330	10,570	5.0
TOTAL	**930**	**11,515**	**38,210**	**24,383**	**8843**	**307,345**	**N/A**

V. INCREMENT "C"

Increment "C" projects involve renewable energy sources, primarily solar and biomass. Solar projects failed to justify themselves. However, using biomass (wood) as an alternate to coal for boiler fuel did prove favorable. Total life cycle benefits were estimated to be $601,925 with a construction cost of $328,500. This yielded an SIR ratio of 1.83 for the project.

VI. INCREMENT "D"

Increment "D" projects involve cogeneration and the use of solid waste for fuel and were not funded for study.

VII. INCREMENT "E"

Increment "E" involves determining the feasibility of installing a central boiler plant to serve all or part of the Blue Grass Facility. As noted earlier, Blue Grass is heated by individual oil fired boilers located throughout the facility. The vast area and rather small heating loads of the Restricted Area makes installing a central plant infeasible. The Administration Area is more compact and could more readily accommodate a central plant. (See Figure 1-5) The plant would eliminate the need to use 19 oil fired boilers or furnaces (an equivalent of 200,000 gal. of oil per year), but would cost $8,940,000.

A life cycle cost analysis was performed for two alternatives. The first case is to build a central coal fired plant for the facility (20 yr. life) and the second case is to continue to use the existing individual oil fired boiler for their remaining 20 year life. Letting the existing boilers supply heat to the area yields a lower life cycle cost than the central cost plant. Therefore, it is recommended that the coal plant not be built until the existing oil boilers must be replaced. Pages 3-310 thru 3-318 show the cost estimate and calculation details.

VIII. ENERGY PLAN

Table 1-12 gives a summary of all projects and recommendations and the resultant savings and ECIP ratios. The projected savings represent a reduction of energy consumption for FY 1985 of 56% over energy consumed in FY 1975. The Annual Energy Index (given in BTU/SF/YR) for the entire depot is projected to be 152,520 for 1985. Table 1-13 gives abbreviations used throughout the report.

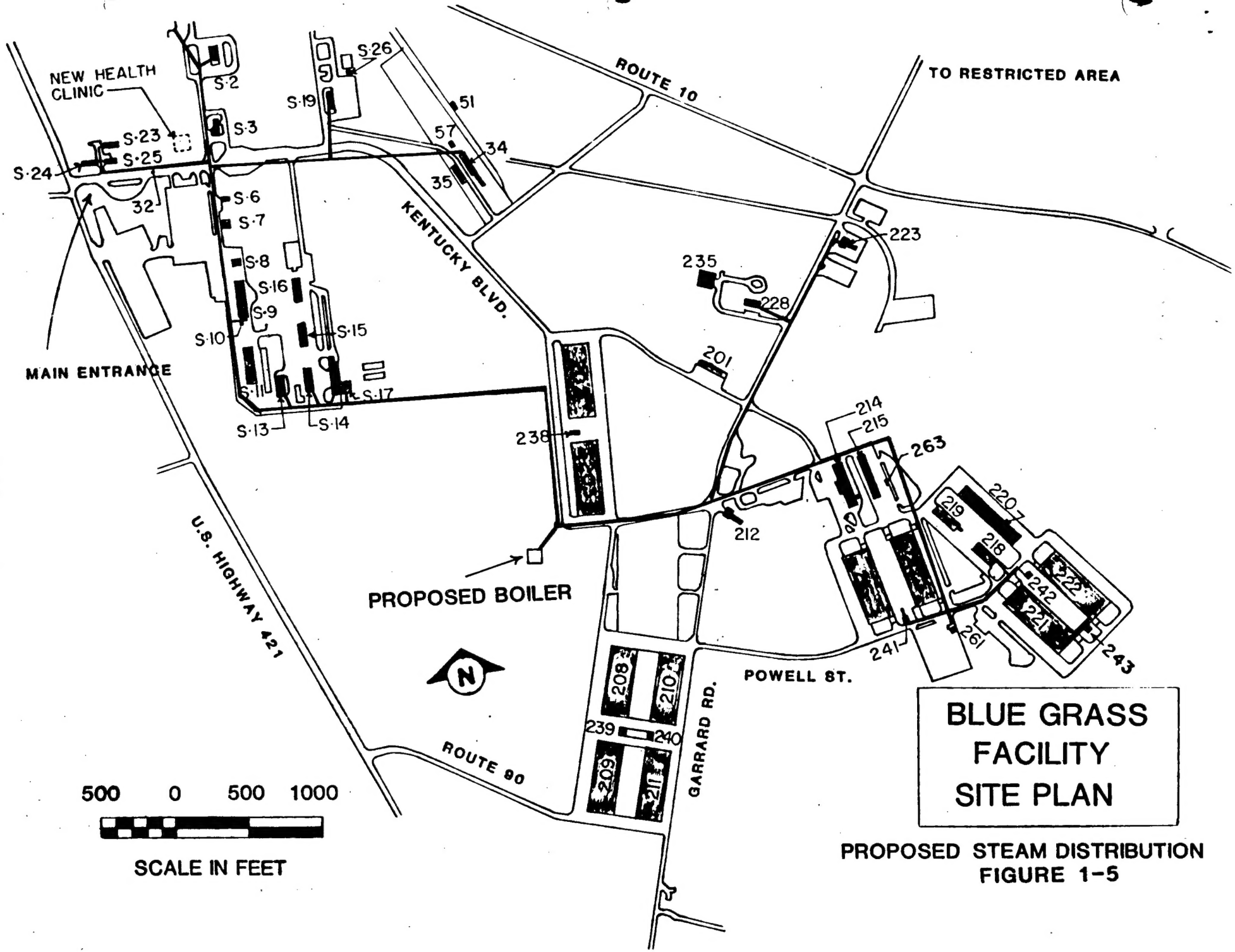

NEW HEALTH CLINIC
S-2
S-3
S-19
S-26
ROUTE 10
TO RESTRICTED AREA
51
57
34
35
S-23
S-25
S-24
32
S-6
S-7
S-8
S-16
S-9
S-10
S-15
S-11
S-17
S-13
S-14
MAIN ENTRANCE
KENTUCKY BLVD.
235
228
223
201
238
214
215
263
220
219
218
212
PROPOSED BOILER
U.S. HIGHWAY 421
N
208
210
239
240
209
211
GARRARD RD.
POWELL ST.
242
221
241
261
243
ROUTE 90
500 0 500 1000
SCALE IN FEET
BLUE GRASS FACILITY SITE PLAN
PROPOSED STEAM DISTRIBUTION
FIGURE 1-5

TABLE 1-12

LEXINGTON & BLUEGRASS PROJECT SUMMARY

PROJECT	ANALYSIS DATE CONSTRUCTION COST $	SIOH COST $	DESIGN COST $	ENERGY SAVINGS MBTU / YR.	ANALYSIS DATE ANNUAL SAVINGS $	TOTAL NET DISCOUNTED SAVINGS $	SIR
A1 Insulation	130,150	6,508	7,809	14,805	87,539	1,593,344	12.3
A2 Down-Blowers	79,800	3,990	4,788	5,420	19,062	257,771	3.2
A3 Heat/Cool Mod.	163,690	8,185	9,822	20,170	83,056	1,104,955	6.7
B1 Boiler Plant	228,000	11,400	13,680	31,860	77,591	1,455,630	6.4
C1 Biomass Mod.	328,500	16,390	19,710	3,362	41,838	601,925	1.8
F1 Insulation	4,960	-	-	3,390	9,170	132,690	26.8
F2 Lighting Mod.	42,670	-	-	5,123	14,293	164,085	3.9
F3 DHW Timers	2,095	-	-	330	920	10,570	5.0
G1 DHW Temp. Rod.	120	6	7	35	98	1,496	12.5
G2 Seal Dampers	1,800	90	108	1,092	2,457	50,172	27.9
G3 Replace Comp.	2,900	145	174	370	1,032	11,851	4.1
G4 Install louvers	1,000	50	60	180	1,778	31,442	31.5
G5 Delamping	460	23	28	1,510	4,213	64,102	139.6

TABLE 1-13

ABBREVIATIONS USED

A	Area	EEF	Efficiency
AG	Area of Glass	^{o}F	Degree Farenheit
AF	Area of Floor	F. O.	Fuel Oil
AR	Area of Roof	Gal	Gallons
AW	Area of Wall, net	HR	Hour
B/C	Benefit to Cost Ratio	HDD	Heating Degree Days
BG	Blue Grass	H-O-A	Hand-Off-Auto Switch
BTU	British Thermal Units	KW	Kilowatt
BTUH	BTU/hr	KWH	Kilowatt/hr.
C	Coal	HP	Horsepower
CDD	Cooling Degree Days	L	Length
CF	Cubic Feet	Lex	Lexington
CFM	Cubic Feet per Minute	MBTU	1,000,000 BTU
COP	Coefficient of Performance	N.C.	Normally Closed
CWE	Current Working Estimate	N.O.	Normally Open
Deg	Degrees	Q,q	Heat Load Energy Consumption
DD	Degree Days	R	Insulation Resistance, Hr.SF.of/BTU
E	Electricity	SF	Square Feet
E/C	Energy to Cost Ratio	T	Temperature
EASS	Economic Analysis Summary Sheet	T	Change in Temperature
Elec	Electricity	U	Thermal Transfer Coefficient (BTU/hr-SF-^{o}F)
ECIP	Energy Conservation Investment Program	Uo	Overall U Value
EER	Energy Efficiency Ratio	T.C.	Time Clock
		LTO	Low Temperazture Override
		TOA	Outside Air Temperature